PATENT SPECIFICATION

724,596

Date of Application and filing Complete Specification: May 4, 1953. No. 12306/53.

Application made in Netherlands on May 7, 1952.

Complete Specification Published: Feb. 23, 1955.

Index at acceptance:—Class 38(1), E(7B:18:22B).

COMPLETE SPECIFICATION

Improvements in or relating to Water-tight Electric Connection Boxes

We, PHILIPS ELECTRICAL INDUSTRIES LIMITED, of Spencer House, South Place, Finsbury, London, E.C.2, a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement :—

The invention relates to a water-tight electric connection box, comprising primarily a base, on which a cap is screwed, this base being provided with a plurality of apertures to pass cables introduced in the direction of the axis of the cap and with at least one stuffing cushion of elastic material housed in a stuffing box round a cable aperture, and having a corresponding aperture and being compressed by an elevation of a gland provided inside the box, this elevation operating as a ram. In a known connecting box of this kind a compressing force is exerted simultaneously on a plurality of stuffing cushions, this force being supplied by a gland on which acts a screw bolt which is provided inside the box and which is screwed in a nut embedded in the material of the base. This device has the advantage that each cable introduced does not require a separate tightening nut or cap nut.

The invention has for its object to provide a construction, by which this advantage is also obtained, but which is simpler and cheaper. According to the invention the tightening force is supplied by the screw cap, the latter being provided with an internal shoulder which exerts pressure on the gland via a packing ring provided near the edge of the gland. Consequently the screw joint between the cap and the base is utilised at the same time for tightening the gland.

As will be explained more fully hereinafter, a reliable sealing may be obtained, even if the wires to be introduced differ comparatively much in diameter, if the sealing means for the various cables are shaped in a form such that, if the gland is pressed inadequately tight at least one space not filled out by the elastic cushion is provided between the walls of the stuffing box and the elevation operating as a ram, the material of the cushion being capable of escaping elastically into this space, if the gland is additionally tightened in the axial direction. This possibility of escape may be obtained by a decrease in the cross-sectional area of the at least substantially round box containing the stuffing cushion in the direction of the pressure exerted by the elevation operating as a ram and by having a larger sectional area of the cushion in its free condition than the minimum sectional area of the box.

The invention will be explained more fully with reference to the drawing, in which :

Fig. 1 is an axial sectional view of one embodiment having five cable apertures (the section being taken on the broken line I—I of Fig. 2) ;

Fig. 2 is a cross-sectional view taken on the line II—II of Fig. 1 ;

Fig. 3 is an axial sectional view of one embodiment having two cable apertures ; and

Fig. 4 is a cross-sectional view taken on the line IV—IV of Fig. 3.

The connection box shown in Figs. 1 and 2 comprises primarily a base 1, a gland 3 and a screw cap 5, all three made of synthetic resin. The cap 5 is internally threaded (7) and is screwed on to the base 1. The latter is provided with a flange 9 for mounting the assembly on a wall and with a plurality of apertures 11, 13, 15, 17 and 19, with which apertures 21, 23, 25, 27 and 29 of the gland 3 correspond. These apertures serve to receive cables in an axial direction, of which one (31) is shown in Fig. 1.

The apertures must be moisture-tight. For this purpose the apertures 11 to 19 in the base 1 (for example, the aperture 15) each have a conical widened part or box 33 at the top end, in which is provided an annular stuffing cushion 35 of elastic material,

for example, flexible rubber. This cushion may be compressed by an annular elevation 37 on the bottom side of the gland 3, this elevation operating as a ram. The compressing force is supplied by the screw cap 5, which is, for this purpose, provided with an internal shoulder 39, which exerts an axial force via a packing ring 41 on the edge of the gland 3.

Provision is made for the sealing of the cables to be moisture-tight, even if the diameter of one of the cables for example, the cable 43, shown in broken lines, in the aperture 11-21 deviates materially from the internal diameter of the stuffing cushion 45 and, for example, is 15 per cent smaller. It is evident that in this case the associated ram 47 would have to penetrate considerably more deeply into the box 51, if no particular measures were taken, before the cushion 45 is sufficiently compressed, than the ram 37 would have to penetrate for compressing the cushion 35.

However, this cannot be obtained by means of the screw cap 5, since this exerts a uniform pressure at all points along the shoulder 39, at least it is moved downwards over a uniform distance, when the cap is tightened. The difficulty involved in the aforesaid requirement is solved by providing a shape of the stuffing means such that each stuffing cushion even if it has been pressed down to such an extent that the introduced cable is sufficiently sealed, allows, in general, an additional compression, so that it is always possible to compress sufficiently those cushions which have to seal an excessively thin cable.

Fig. 1 shows one embodiment by which this result may be obtained. In the condition of the box shown, in which it is not completely tightened, the stuffing boxes 33 and 51 have empty spaces 53 and 55 respectively, under the cushions 35 and 45 respectively, since the boxes terminate conically towards the bottom and the sectional areas of the associated rubber cushions, in the free state, exceed the minimum sectional areas (bottom surfaces) of the boxes. Consequently, the cushions do not reach immediately the bottoms of the boxes, but leave a space, into which the elastic material can escape, when the cap is further tightened.

In the condition shown the cable 31 is already sealed, however, the cushion 35 may be pressed down further without much difficulty, since the elastic material can escape into the space 53. In the meantime the cushion 45 is compressed axially; the elastic material escapes radially to the inner side, so that the space 55 remains empty, until also the excessively thin cable 43 is sufficiently sealed.

If the cable 43 is so thin or is not circular to an extent such that even after the space 53 around the cable 31 has been completely filled by the cushion 35, the sealing of the cable 43 is still insufficient, the material of the cushion 35 may escape also upwards along the ram 37, into two annular spaces 61 and 63, formed between the ram 37 and the walls of the box 33 (the outer side of the cable 31 being considered to constitute also a wall of this box).

This possibility of escape is obtained, since the edge of the elevation 37 operating as a ram, is comparatively sharp, so that on each side of the edge one annular space 61 and 63 respectively is formed. Thus, if necessary, the cap 5 may be pressed down a little further, in order to obtain a satisfactory sealing of the cable 43.

The stuffing cushions in the apertures 11 to 19 (*inter alia*, the cushions 35 and 45) are made of very flexible, elastic material. The packing ring 41 is preferably made of slightly more rigid material, in order to prevent ripples from being formed in the ring. As an alternative, the top side of the ring 41 may be painted with graphite, in order to facilitate the sliding of the edge 39.

In the case in which less than five cables are to be introduced into the box, the base is made so that it has thin sealing walls 65 in the apertures 11 to 19; these walls can be readily broken away separately for the introduction of cables.

Figs. 3 and 4 shows a second embodiment of the invention, which has a smaller size and is provided for the introduction of two cables only (71 and 73). The construction is otherwise identical with that shown in Figs. 1 and 2, the difference being, however, that use is made of only one stuffing cushion, consisting of two primarily annular parts 75 and 77, which are secured to one another by a narrow connecting piece 79. This may facilitate the mounting, since the number of parts to be mounted is reduced by one. A further difference from the construction shown in Fig. 1 is that the sectional areas of the stuffing boxes do not diminish gradually; since each box is composed of two cylindrical portions, of which one lies over the other and the lower portion 81 or 83 has a slightly smaller sectional area than the upper portion.

What we claim is:—

1. A water-tight electric connection-box, primarily comprising a base, having a cap screwed on to it, this base being provided with a plurality of apertures to pass cables introduced in the axial direction of the cap and with at least one stuffing cushion of elastic material, housed in a stuffing box round a cable aperture and having a corresponding aperture and being compressed by an elevation of a gland provided inside the box, the elevation operating as a ram, characterised in that the pressing force is

supplied by the screw cap, the latter being provided with an internal shoulder, which exerts pressure on the gland via a packing ring provided near the edge of the gland.

2. A water-tight connection box as claimed in Claim 1, characterised in that the sealing means for the various cables are shaped such that in the inadequately tightened condition of the gland at least one space not filled by the elastic cushion is left between the walls of the stuffing box and the elevation operating as a ram, the material of this cushion, when the gland is tightened further, being capable of escaping elastically in an axial direction into this space.

3. A water-tight connection box as claimed in Claim 1 or 2, characterised in that the cross-sectional area of the at least substantially circular box containing the stuffing cushion decreases in the direction of the pressure exerted by the elevation operating as a ram and in that the sectional area of the cushion, in its free condition, exceeds the minimum sectional area of the box.

4. A water-tight connection box as claimed in Claim 3, characterised in that the elevation has a comparatively sharp pressing edge.

5. A water-tight connection box as claimed in any of the preceding claims, characterised in that the stuffing cushion around the cable is made of more flexible material than the packing ring between the cap and the gland.

6. A water-tight connection box as claimed in Claim 5, characterised in that graphite powder is applied to the packing ring.

7. A water-tight connection box as claimed in any of the preceding claims, characterised in that on one side the base is provided with a flange to mount the box on a wall.

8. A water-tight connection box having a base of synthetic resin, as claimed in any of the preceding claims, characterised in that a thin wall of synthetic resin is provided in each of the apertures of the base, these walls sealing the apertures concerned, but being readily removable.

Dated this 4th day of May, 1953.

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Printed for Her Majesty's Stationery Office by Wickes & Andrews, Ltd., E.C.4. 39/244.—1955.
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies may be obtained.

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2 SHEETS

This drawing is a reproduction of the Original on a reduced scale.

SHEET 1

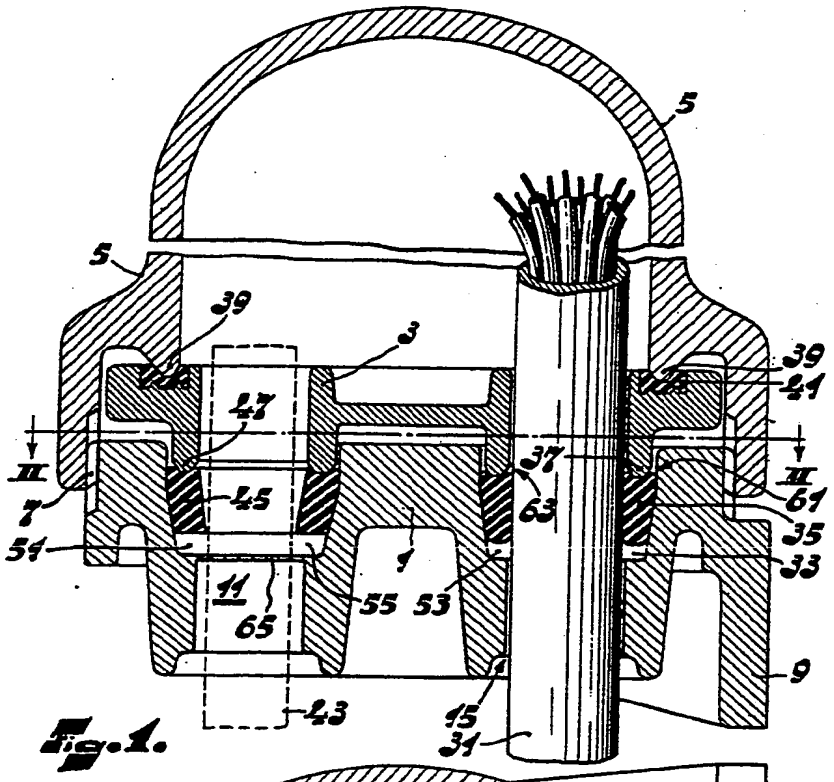

Fig. 1.

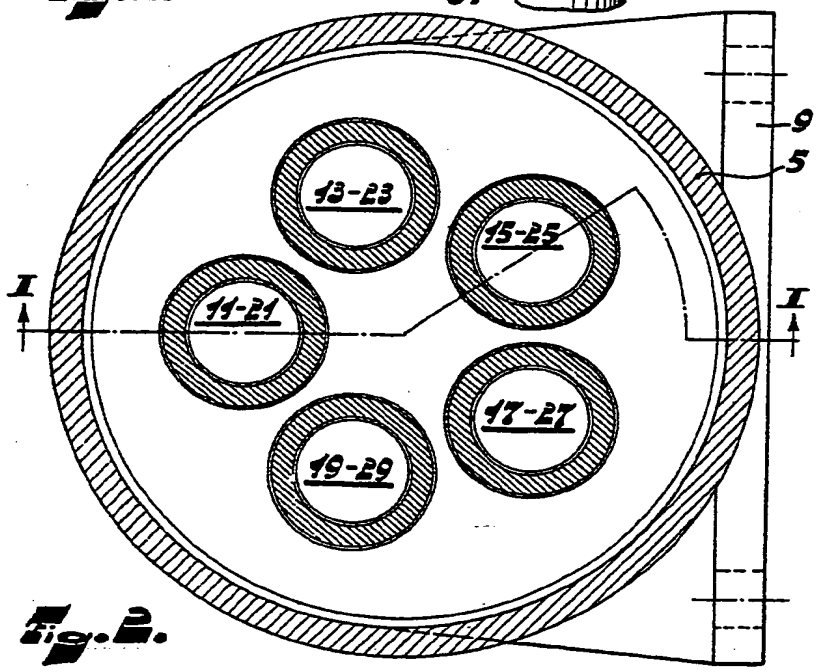

Fig. 2.

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This drawing is a reproduction of the Original on a reduced scale.

SHEET 2

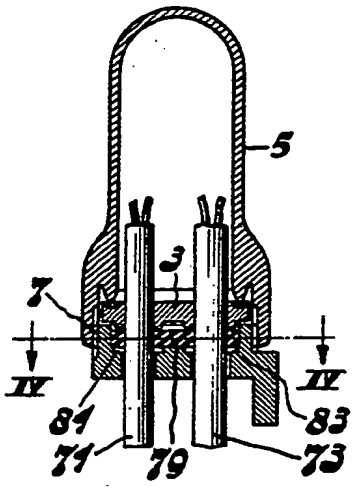

Fig. 3.

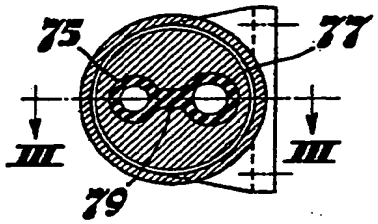

Fig. 4.